

USER MANUAL

MODEL 1089/I 10BaseT HDSL *Rocket*



PATTON
Electronics Co.



An ISO-9001
Certified
Company

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1.0 WARRANTY INFORMATION

Patton Electronics warrants all Model 1089 components to be free from defects, and will—at our option—repair or replace the product should it fail within one year from the first date of shipment.

This warranty is limited to defects in workmanship or materials, and does not cover customer damage, abuse or unauthorized modification. If this product fails or does not perform as warranted, your sole recourse shall be repair or replacement as described above. Under no condition shall **Patton Electronics** be liable for any damages incurred by the use of this product. These damages include, but are not limited to, the following: lost profits, lost savings and incidental or consequential damages arising from the use of or inability to use this product. **Patton Electronics** specifically disclaims all other warranties, expressed or implied, and the installation or use of this product shall be deemed an acceptance of these terms by the user.

1.1 RADIO AND TV INTERFERENCE

The Model 1089 generates and uses radio frequency energy, and if not installed and used properly—that is, in strict accordance with the manufacturer's instructions—may cause interference to radio and television reception. The Model 1089 has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection from such interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular installation. If the Model 1089 does cause interference to radio or television reception, which can be determined by disconnecting the unit, the user is encouraged to try to correct the interference by one or more of the following measures: moving the computing equipment away from the receiver, re-orienting the receiving antenna and/or plugging the receiving equipment into a different AC outlet (such that the computing equipment and receiver are on different branches).

1.2 CE NOTICE

The CE symbol on your Patton Electronics equipment indicates that it is in compliance with the Electromagnetic Compatibility (EMC) directive and the Low Voltage Directive (LVD) of the European Union (EU). A Certificate of Compliance is available by contacting Technical Support.

1.3 SERVICE

All warranty and non-warranty repairs must be returned freight prepaid and insured to Patton Electronics. All returns must have a Return Materials Authorization number on the outside of the shipping container. This number may be obtained from Patton Electronics Technical Service at:

tel: **(301)975-1007**
email: **support@patton.com**
www: **http://www.patton.com**

NOTE: Packages received without an RMA number will not be accepted.

Patton Electronics' technical staff is also available to answer any questions that might arise concerning the installation or use of your Model 1089. Technical Service hours: **8AM to 5PM EST, Monday through Friday.**

2.0 GENERAL INFORMATION

Thank you for your purchase of this Patton Electronics product. This product has been thoroughly inspected and tested and is warranted for One Year parts and labor. If any questions or problems arise during installation or use of this product, please do not hesitate to contact Patton Electronics Technical Support at (301) 975-1007.

2.1 FEATURES

- Provides MAC Level (Layer 2) connection between 2 peered 10BaseT Ethernet LANs
- Operates transparently to higher level protocols such as TCP/IP, DECnet, NETBEUI and IPX
- Automatically discovers, loads and deletes MAC addresses
- Point-to-Point Connectivity over 2-Wire HDSL up to 5km
- HTTP/SNMP Manageable as CP (Customer Premises) Unit with 1094ARC CO (Central Office) Rack Card
- Internal or receive recovered clocking between units
- LED indicators for 10BaseT Link, DSL Link, Status, No Signal, Error and Test Mode

2.2 DESCRIPTION

The **NetLink™ 10BaseT HDSL Rocket** (Model 1089) is a Multi-Rate DSL Modem that provides seamless MAC Layer connectivity between 2 peered 10BaseT LANs. Now, Enterprise users no longer need to hassle with a bridge *and* a CSU/DSU or recurring leased line costs. The NetLink Rocket allows users to add additional nodes to a LAN that has reached its maximum distance limits or separate high traffic areas of a LAN. The Rocket connects peered LANs and automatically forwards and receives LAN broadcasts, multi-casts and frames across a 2-Wire DSL span.

The **NetLink™ HDSL 10BaseT Rocket** features include loopback diagnostics, inband SNMP/HTTP remote management capabilities using NetLink Plug-and-Play and externally accessible configuration switches. As a symmetric DSL modem, the **NetLink™ HDSL Rocket** offers the same data rates in both directions over a single pair of regular telephone lines using 2B1Q modulation. The Rocket connects to the DSL line via an RJ-45 jack. Standard power options include 115VAC, 230VAC, Universal (100/240VAC) and any DC input between 36-60VDC.

3.0 CONFIGURATION

The Model 1089 has two sets of eight DIP switches, which allow configuration for a wide variety of applications. This section describes switch locations and explains all settings.

3.1 CONFIGURING THE HARDWARE DIP SWITCHES

The 16 external switches are grouped into two eight-switch sets, and are externally accessible from the underside of the Model 1089, as shown in Figure 1, below).

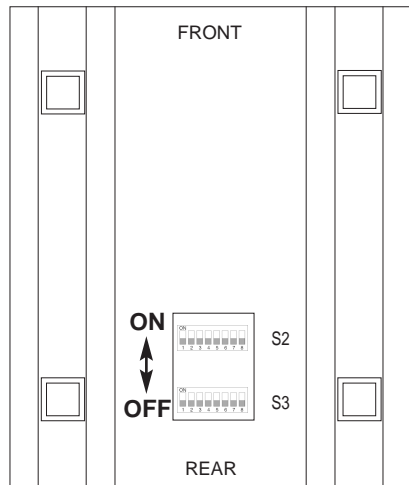


Figure 1. Underside of Model 1089 Series, showing location of DIP switches

The two sets of DIP switches on the underside of the Model 1089 will be referred to in this manual as S2 and S3. As Figure 2 shows, the orientation of all DIP switches is the same with respect to “ON” and “OFF” positions.

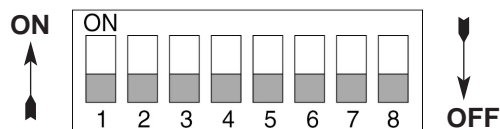


Figure 2. Close Up of Configuration Switches (all sets are identical in appearance)

3.1.1 Configuration DIP Switch Set “S2”

The only setting for S2 is for Clocking Mode between Model 1089s. All other switches are reserved for factory usage and must remain in the default configuration. Default settings are shown in the table below.

S2 SUMMARY TABLE			
Position	Function	Factory Default	
S2-1	Reserved	Off	
S2-2	Reserved	Off	
S2-3	Reserved	Off	
S2-4	Reserved	Off	
S2-5	Reserved	Off	
S2-6	Clock Mode	On	Receive
S2-7	Clock Mode	Off	Recover
S2-8	Reserved	Off	

Switch S2-1, S2-2, S2-3, S2-4, S2-5 and S2-8:

Switches S2-1, S2-2, S2-3, S2-4, S2-5 and S2-8 are reserved for factory use and must remain in the factory default settings as shown in the table above. .

Switches S2-6 and S2-7: Clock Mode

Use Switches S2-6 and S2-7 to configure internal, or receive recover (clocking derived from the remote Model 1089 across the DSL span) settings. One Model 1089 (typically the CO, or “Central Office” unit) will be set for Internal Clock. The remote Model 1089 (typically the CP, or Customer Premises unit) will be set for Receive Recover clocking. The table below shows the clock mode settings.

CO/CP Unit	S2-6	S2-7	Clock Mode	Description
CO	On	On	Internal	Model 1089 generates internal, crystal controlled timing.
CP	On	Off	Receive Recover	Model 1089 receives its timing from the CO unit over the DSL span.

3.1.2 Configuration Switch Set “S3”

Use the DIP Switches in Switch S3 to set the DTE Rate (for LAN Bandwidth Allocation), the transmit data sampling point and to reset the unit to its software default settings. The following table summarizes default positions of DIP Switch S3. Detailed descriptions of each switch follow the table.

S3 SUMMARY TABLE		
Position	Function	Factory Default
S3-1	DTE Rate	On
S3-2	DTE Rate	Off
S3-3	DTE Rate	Off
S3-4	DTE Rate	Off
S3-5	DTE Rate	On
S3-6	DTE Rate	On
S3-7	Reset Software Defaults	On Normal Operation
S3-8	Reserved	On

Switch S3-1 through S3-6: DTE Rate

Use Switch S3-1 through S3-6 to provision bandwidth to the LAN in 64kbps increments up to 1.152Mbps. Peak bandwidth utilization on the local domain on an Ethernet LAN runs typically between 15% to 20% (1.5Mbps to 2Mbps) of the maximum bit rate of 10Mbps. Traffic between LANs typically runs even lower -- between 2% to 7% (200kbps to 700kbps) of the maximum bit rate depending upon application and environmental conditions. This is the amount of traffic that will run across the DSL span.

Set Switches 3-1 through S3-6 to allocate bandwidth based upon expected LAN to LAN traffic rates. As an example, set applications which low LAN to LAN bandwidth content between 64kbps and 576kbps. Applications with high bandwidth LAN to LAN content should be set between 576kbps and 2.304Mbps as required.

S3-1	S3-2	S3-3	S3-4	S3-5	S3-6	DTE Rate (kbps)
Off	Off	On	On	On	On	64
On	On	Off	On	On	On	128
Off	On	Off	On	On	On	192
On	Off	Off	On	On	On	256
Off	Off	Off	On	On	On	320
On	On	On	Off	On	On	384

Off	On	On	Off	On	On	448
On	Off	On	Off	On	On	512
Off	Off	On	Off	On	On	576
On	On	Off	Off	On	On	640
Off	On	Off	Off	On	On	704
On	Off	Off	Off	On	On	768
Off	Off	Off	Off	On	On	832
On	On	On	On	Off	On	896
Off	On	On	On	Off	On	960
On	Off	On	On	Off	On	1024
Off	Off	On	On	Off	On	1089
On	On	Off	On	Off	On	1152

NOTE: The Model 1089 will automatically select the optimum line rate for the required distance based on the DTE rate set by Switches S3-1 through S3-6. This selection is based on the lowest line rate that will support the DTE rate.

Switch S3-7: Reset Software Defaults

Use Switch S3-7 to reset the software configured factory defaults. This feature is applicable only using the Model 1001MC to SNMP manage your units. For more information, please refer to the Model 1001MC Operations Manual.

S3-7	Setting
On	Normal Operation
Off	Reset

Switch S3-8: Reserved

Switch S3-8 is reserved for factory use and must remain in the On position.

4.0 INSTALLATION

When the Model 1089 has been properly configured, it may be connected to the DSL twisted pair interface, the 10BaseT Ethernet Interface, and the power source. This section describes these connections.

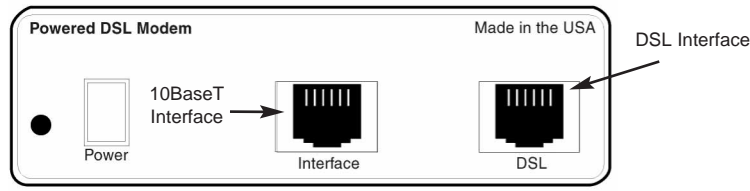


Figure 3. Model 1089 Rear Panel

4.1 CONNECTING THE DSL INTERFACE

The Model 1089 supports communication between 10BaseT Hubs or Workstations at distances to 5 miles (8 km) over 24 AWG (.5mm) twisted pair wire. Two things are essential:

1. These units operate as a **pair**. Both units at the end of the twisted pair DSL span must be set for the same DTE rate.
2. To function properly, the Model 1089 needs one **twisted** pair of metallic wire. This twisted pair must be **unconditioned**, dry, metallic wire, between 19 (.9mm) and 26 AWG (.4mm) (the higher number gauges will limit distance). Standard dial-up telephone circuits, or leased circuits that run through signal equalization equipment, or standard, flat modular telephone type cable, *will not work!*

The RJ-45 connector on the Model 1089's twisted pair interface is polarity insensitive and is wired for a two-wire interface. The signal/pin relationships are shown in Figure 4 below.

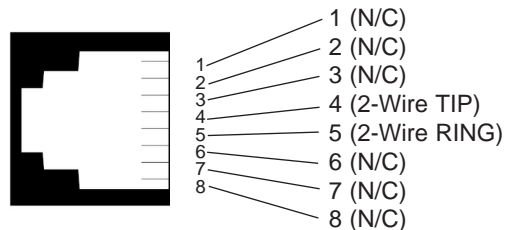
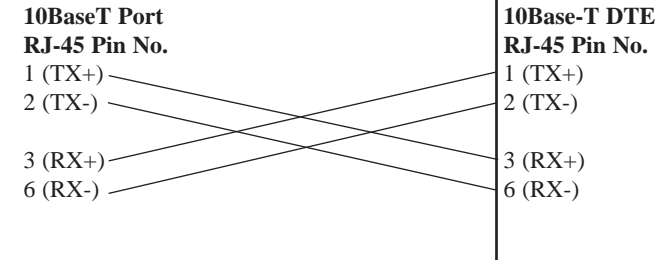


Figure 4. Model 1089 twisted pair line interface.

IMPORTANT!: The Model 1089 has been optimized for performance at high bitrates (DTE rates greater than 512 kbps). To ensure accurate performance at these bit rates, please use twisted pair line interface cable that is at least 330ft (100m) in length.

4.2 Connecting the 10Base-T Ethernet Port to a PC (DTE)

The 10Base-T interface is configured as DTE (Data Terminal Equipment). If the Model 1089 is to connect to another DTE device such as a 10Base-T network interface card, construct a 10Base-T crossover cable and connect the wires as shown in the diagram below.



4.3 Connecting the 10Base-T Ethernet Port to a Hub

The 10Base-T interface is configured as DTE (Data Terminal Equipment), just like a 10Base-T network interface card in a PC. Therefore, it "expects" to connect to a 10Base-T Hub using a straight-through RJ-45 cable. Use the diagram below to construct a cable to connect the 10 BaseT interface to a 10Base-T Hub.

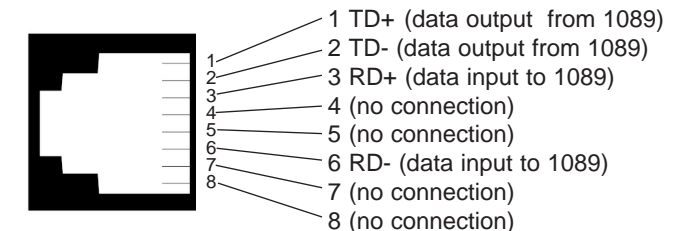
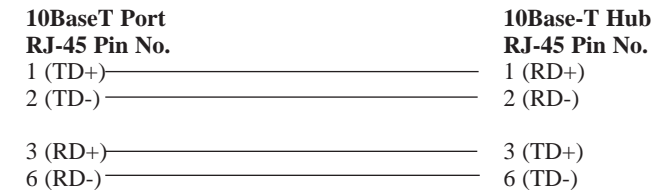


Figure 5. Model 1089 10BaseT Ethernet RJ-45 Connector Pinout

5.0 OPERATION

4.4 POWER CONNECTION

Universal AC Power (100-240VAC)

The Model 1089 uses a 5VDC, 2A universal input 100-240VAC, power supply (center pin is +5V). The universal input power supply has a male IEC-320 power entry connector. This power supply connects to the Model 1089 by means of a barrel jack on the rear panel. Many international power cords are available for the universal power supply (Please refer to Appendix B for country-specific power cords).

The Model 1089 powers up as soon as it is plugged into an AC outlet--there is no power switch.

120 VAC Power (US)

The 100-132 VAC adapter supplied with the U.S. version of the Model 1089 is a wall mount type and may be plugged into any approved 120 VAC wall jack.

230 VAC Power (International)

The 230 VAC adapter supplied with the International version of the Model 1089 is a wall mount type and may be plugged into any approved 230 VAC wall jack.

DC Power

The 36-60 VDC DC to DC adapter supplied with the DC version of the Model 1089 plugs in a DC source (nominal 48VDC) and plugs into the barrel power supply jack on the rear of the 1089/I. Please refer to Figure 5, below, to make the proper connection.

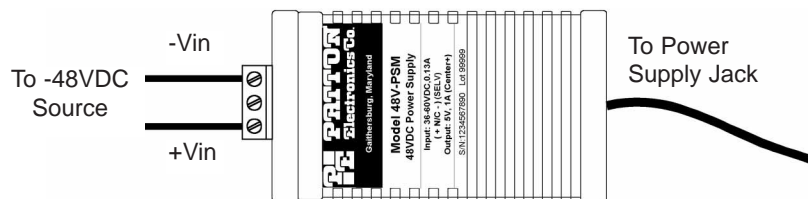


Figure 6. Connecting DC Power to the 48V-PSM DC Power Supply.

WARNING! There are no user-serviceable parts in the power supply section of the Model 1089. Contact Patton Electronics Technical support at (301)975-1007, via our web site at <http://www.patton.com>, or by e-mail at support@patton.com, for more information.

When the Model 1089 has been properly configured and installed, it should operate transparently. This sections describes power-up, LED status monitors, and the built-in loopback test modes.

5.1 POWER-UP

Before applying power to the Model 1089, please read **Section 4.3 and ensure** that the unit is connected to the appropriate power source.

5.2 LED STATUS MONITORS

The Model 1089 features six front panel LEDs that monitor connections on the DSL and 10BaseT links, signaling, error and test modes. Figure 6 (below) shows the front panel location of each LED. Descriptions of each LED follow Figure 6.

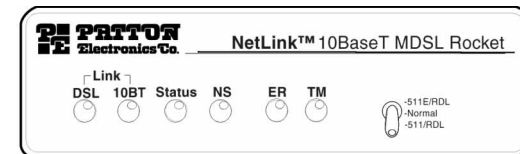


Figure 7. Model 1088 Front Panel

- | | | | | | | | | | | | | | | | | | | | |
|-----------------|---|---|---|-----------------------|----------|---|---|----------|---|---|----------|---|---------------------------|----------|---|--------------------------------|----------|---|--|
| DSL Link | (Active Green) Solid green (On) indicates that the end to end DSL Frammer Link is up, signifying that the link across the DSL span is active. The DSL Link LED is Off when the link is down. | | | | | | | | | | | | | | | | | | |
| Status | Blinks yellow from one to eleven times to indicate system status. Each pulse pattern is separated by a 2 second "off" period. Greater pulse patterns have higher priority (buffer saturation has greater priority than an empty MAC table). Valid system statuses are:

<table border="0"><tr><td>1 pulse</td><td>=</td><td>system status is okay</td></tr><tr><td>2 pulses</td><td>=</td><td>no MAC entries in the MAC Address Table</td></tr><tr><td>3 pulses</td><td>=</td><td>Clear to Send (CTS) or Carrier Detect (DCD) from base unit are not asserted</td></tr><tr><td>4 pulses</td><td>=</td><td>IM1/I buffer is saturated</td></tr><tr><td>5 pulses</td><td>=</td><td>WAN receive frame(s) too large</td></tr><tr><td>6 pulses</td><td>=</td><td>WAN receive frame(s) not octet aligned</td></tr></table> | 1 pulse | = | system status is okay | 2 pulses | = | no MAC entries in the MAC Address Table | 3 pulses | = | Clear to Send (CTS) or Carrier Detect (DCD) from base unit are not asserted | 4 pulses | = | IM1/I buffer is saturated | 5 pulses | = | WAN receive frame(s) too large | 6 pulses | = | WAN receive frame(s) not octet aligned |
| 1 pulse | = | system status is okay | | | | | | | | | | | | | | | | | |
| 2 pulses | = | no MAC entries in the MAC Address Table | | | | | | | | | | | | | | | | | |
| 3 pulses | = | Clear to Send (CTS) or Carrier Detect (DCD) from base unit are not asserted | | | | | | | | | | | | | | | | | |
| 4 pulses | = | IM1/I buffer is saturated | | | | | | | | | | | | | | | | | |
| 5 pulses | = | WAN receive frame(s) too large | | | | | | | | | | | | | | | | | |
| 6 pulses | = | WAN receive frame(s) not octet aligned | | | | | | | | | | | | | | | | | |

- 7 pulses = WAN receive frame(s) aborted
- 8 pulses = Detected WAN receive frame(s) with CRC
- 9 pulses = Detected LAN receive frame(s) too large
- 10 pulses = Detected LAN receive frame(s) not octet aligned
- 11 pulses = Detected LAN receive frame(s) with bad CRC

- 10BT Link** (Active Green) Solid green indicates that the 10BaseT Ethernet interface has detected a valid SQE heartbeat, signifying a valid 10BaseT connection.
- NS** (Active Red) Solid red indicates that the Digital Signal Processors (DSPs) are not linked.
- ER** (Active Red) Flashing red indicates CRC Errors on DSL (Framer) side if DSL Link is active or if bit errors are received during loop/BER test.
- ER flashes once to indicate a CRC error (during normal operation) or bit errors (during Remote Loopback 511/511E tests).
- TM** (Active Yellow) Solid Yellow indicates an Active Test Mode. The unit may be placed in test mode by the local user or by the remote user.

5.3 TEST MODES

The Model 1089 offers a proprietary Remote Loopback test modes, plus a built-in V.52 BER test pattern generator to evaluate the communication status between units. Activate this test mode by toggling the Test Mode Switch on the front panel of the unit.

5.3.1 Overview

Figure 8 below shows the major elements used in the loop-back and 511 pattern tests available in the Model 1089. Each block has several functions. Following Figure 7 are descriptions of the elements during Test Modes.

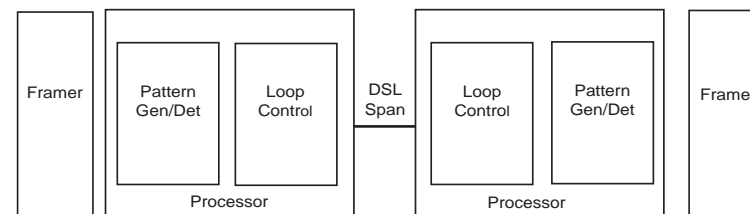


Figure 8: Block Diagram Two Model 1089s Communicating over the DSL Span

Framer

The framer determines the status of the line. In normal operation the framer transmits and expects to receive framed packets from the far end. If the framer receives framed packets from the far end, the DSL Link LED will turn on. If framed packets are not received, the DSL Link LED will turn off. The restart procedure uses this information to determine if a valid connection is made (cable disconnect, poor cable quality, etc). In normal Data Mode, if the box receives 4 seconds of unframed packets it will restart the box and begin trying to re-establish a connection

with the the remote Model 1089. The distinction between framed packets and unframed packets becomes important when we discuss the Pattern Generator.

Pattern Gen/Det

This part of the Processor generates and detects the 511/511E patterns. When transmitting 511 patterns, the information is unframed

(because it originates after the framer) and is intended to be evaluated only by another Processor. If the units are transmitting data and the pattern generator is enabled on one end of the link, the far end will begin receiving unframed packets and assume that the line has gone down. During test modes, the pattern generator is forced to time out before it can cause the DSL link to go down.

Loop Control

This part of the Processor is used to control Remote Loopback test mode. In a Remote Loop, the 511/511E data is looped back to the line and to the remote unit over the DSL span.

Restart Procedure and Time Outs

The restart procedure is in place to allow the units to re-establish a connection after the framer begins seeing unframed packets. The Test Mode Timing Chart below shows the amount of time the framer must see consecutive unframed packets before the unit will restart and try to establish a new line connection. The reason that there are different Restart Times will become apparent after reading the rest of the document. The 511/511E Time Out shown refers to the amount of time the 511/511E pattern will be valid. At the end of this time the pattern will automatically turn itself off and the normal data path will be re-established. The ER led will flash indicating to the user that the test has timed out. The ER led will stop flashing once the 511/511E switch is placed into the normal position.

Test Mode Timing	
Item	Elapsed Time (seconds)
Start Up	50
Data Mode	4
511/511E Generator Enabled	60 (The generator will stop after 45 seconds.)
Remote End of an RDL	60
511/511E Time Out	45 (The pattern generator will automatically turn off after 45 seconds. The ER LED will flash until the user turns off the 511/511E switch.)

Symbol Indicators



This symbol designates the origination or the termination of a data path. The direction of the arrow connected distinguish the two data paths.



This symbol designates an invalid data path. If there is data present it should be ignored.

5.3.2 Loops and Patterns

The following section describes the Remote Loopback/BER test modes.

Remote Digital

When Remote Loop/511 or Remote Loop/511E is enabled via the front panel switch, the Remote unit's Restart Timer is set to one minute. This is because when the 511/511E generator is initiated on the local unit, the Remote framer begins seeing unframed packets. The Remote unit can not distinguish the 511/511E pattern from the line being disconnected, so the Restart Timer has been lengthened to allow the pattern generator to function. Once the 511/511E test is started, the Local unit changes its' Restart Timer to one minute. The pattern originates within the Processor and is sent to the Remote unit. It is then looped back to the Local unit where it is evaluated for errors. After 45 seconds, the Pattern Generator will timeout and stops sending the pattern. The ER led will begin blinking until the user turns off the 511/511E switch.

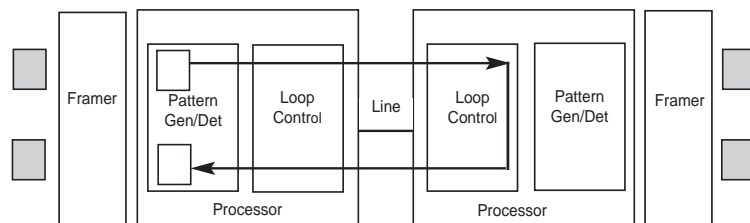


Figure 9: Block Diagram Two Model 1089s Communicating over the DSL Span

5.3.3 The V.52 (BER) Test Pattern Generator

To use the V.52 BER tests in conjunction with the Remote Digital Loopback tests, follow these instructions:

1. Locate the Remote Loop/511 & Remote Loop/511E toggle switch on the front panel of the 1089 and move it DOWN. This activates the Remote Loop with V.52 BER and transmits a "511" test pattern into the loop. If any errors are present, the local unit's red "ER" LED will blink sporadically.

2. If the above test indicates no errors are present, move the test switch V.52 toggle switch UP, activating the "511/E" test with intentional errors present. If the test is working properly, the local unit's red "ER" LED will blink. A successful "511/E" test will confirm that the link is in place, and that the Model 1089's built-in "511" generator and detector are working properly.

APPENDIX A

PATTON ELECTRONICS MODEL 1089 SPECIFICATIONS

Clocking Modes:	Internal or Receive Recovered
DTE Rate:	64, 128, 192, 256, 320, 384, 448, 512, 576, 640, 704, 768, 832, 896, 960, 1024, 1088, and 1152 kbps
Line Rates (DSL line):	144, 272, 400, 528, 784, 1168 kbps
Transmission Line:	Single Twisted Pair
Line Coding:	2B1Q
Line Interface:	Transformer coupled, 1500 VAC isolation
Diagnostics:	V52 compliant (511/511E) pattern generator and detector with error injection mode and Remote Loopback control by a single front panel switch
LED Status:	The following LEDs are displayed on the front panel: DSL Link (Green Active) - DSL Link Active 10BT Link (Green Active) - Valid Ethernet Connection Status (Flashing Yellow) - Status indication from the Ethernet port NS (Red Active) - No signal on DSP Link ER (Flashing Red) - CRC error during normal operation, bit error during pattern generation test TM (Active Yellow) - Test Mode Enabled
Configuration:	Externally accessible dip switches or SNMP managed through 1094ARC
Power:	External desk top transformer, 100-240VAC, 50-60 Hz (Universal Input), 10W or -48 VDC
Compliance:	FCC Part 15, CE, CTR1

Ethernet Specific

Connection:	RJ-45, 10Base-T 802.3 Ethernet
Address Aging:	Entries are deleted after 8 minutes of inactivity
Frame Latency:	1 Frame
Frame Buffer:	512 Frames
Ethernet Physical Connection:	pin 1 Tx Data + pin 2 Tx Data - pin 3 Rx Data + pin 6 Rx Data + pins 4, 5, 7, 8 no connection

APPENDIX B

PATTON ELECTRONICS MODEL 1089 FACTORY REPLACEMENT PARTS AND ACCESSORIES

<u>Patton Electronics Model #</u>	<u>Description</u>
1089/I	10BaseT HDSL Rocket (CAP)
080551	120V Power Supply
080552	230V Power Supply
48V-PSM.....	DC Power Supply Module
08055DCUI	100-240VAC (+5V \pm 5% reg. DC/2A) Universal Input Adapter
0805EUR	European Power Cord CEE 7 ("A")
0805UK	United Kingdom Power Cord ("D")
0805US	American Power Cord ("K")
0805AUS.....	Australia/New Zealand Power Cord ("C")
0805DEN.....	Denmark Power Cord ("E")
0805FR.....	France/Belgium Power Cord ("F")
0805IN.....	India Power Cord ("G")
0805IS	Israel Power Cord ("H")
0805JAP.....	Japan Power Cord ("J")
0805SW.....	Switzerland Power Cord ("L")
07M1089/I	User Manual

APPENDIX D

PATTON ELECTRONICS MODEL 1089 TRANSMISSION DISTANCES

Transmission Distance - Patton NetLink HDSL Model 1089							
		No Cross Talk					
Line Rate kbps	DTE Rates	26 AWG (0.4mm)			24 AWG (0.5mm)		
		feet	miles	km	feet	miles	km
144	64, 128	20700	3.9	6.2	24500	4.6	7.3
272	192, 256	17400	3.3	5.2	24200	4.5	7.2
400	320, 384	15100	2.9	4.6	22600	4.2	6.7
528	448, 512	14900	2.8	4.4	21000	3.9	6.2
784	576, 640, 704, 768	13500	2.6	4.2	18000	3.4	5.4
1040	832, 896, 960, 1024	11900	2.3	3.6	15500	2.9	4.6
1168	1088 - 1152	11000	2.1	3.3	15200	2.8	4.4
Cross Talk (49 adjacent CAP pairs)							
Line Rate kbps	DTE Rates	26 AWG (0.4mm)			24 AWG (0.5mm)		
		feet	miles	km	feet	miles	km
144	64, 128	18600	3.5	5.6	22100	4.2	6.7
272	192, 256	15700	2.9	4.6	21800	4.1	6.5
400	320, 384	12800	2.4	3.8	19200	3.6	5.7
528	448, 512	13000	2.5	4	18300	3.4	5.4
784	576, 640, 704, 768	12200	2.3	3.6	16200	3.1	4.9
1040	832, 896, 960, 1024	10500	1.9	3	13600	2.5	4
1168	1088 - 1152	94000	1.7	2.7	12900	2.4	3.8